Part II

Logarithmic Equations--Equation with one or more logs

ex
$\log_{100} x = -3/2$

$100^{-3/2} = x$

$\frac{1}{1000} = x$

ex
$\log_x 64 = 3$

$(x^3)^{1/3} = 64^{1/3}$

$x = 4$

ex
$\log_x \sqrt{5} = 3/2$

$(x^{3/2})^{2/3} = (\sqrt{5})^{2/3}$

$x = (5^{1/2})^{2/3} = \sqrt[3]{5}$

ex
$\log_x 3 = -2$

$(x^{-2})^{-1/2} = (3)^{-1/2}$

$x = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

ex
$\log_{4x} 9 = 2$

$(4x)^2 = 9$

$16x^2 = 9$

$\sqrt{x^2} = \sqrt{9/16}$

$x = \pm \frac{3}{4}$

$\frac{3}{4}$

Do:

1. $\log_x 27 = 3/4$

$(x^{3/4})^{4/3} = 27^{4/3}$

$= 3^4 = 81$

2. $\log_6 x = 3$

$6^3 = x = 216$

3. $\log_x 7 = 1/2$

$(x^{1/2})^2 = 7^2$

$x = 49$

4. $\log_x \sqrt{5} = 1/4$

$(x^{1/4})^4 = (\sqrt{5})^4$

$5^1 = 25$

Inequalities

If $b > 1$, $x > 0$

and $\log_b x > y$, then $b^y < x$

and $\log_b x < y$, then $b^y > x > 0$

Ex
$\log_8 x < 2$

$8^2 > x > 0$

$0 < x < 64$

Ex
$\log_5 x > 3$

$5^3 < x$

$x > 125$

$\log_b x = \log_b y$ iff $x = y$

ex
$\log_3 (x + 2) = \log_3 (2x)$

$x + 2 = 2x$

$2 = x$

ex

$\log_{10}(3x - 4) < \log_{10}(x + 6)$

$3x - 4 < x + 6$

$2x < 10$

$x < 5$

$3x - 4 > 0$

$x > \frac{4}{3}$

$x + 6 > 0$

$x > -6$

$\frac{4}{3} < x < 5$

Cannot take the log of negative or zero

ex

$\log_4 x^2 = \log_4 (4x - 3)$

$x^2 = 4x - 3$

$x^2 - 4x + 3 = 0$

$(x - 3)(x - 1) = 0$

$x = 3 \quad x = 1$ ✓

HW
p536
47-61odd, 54, 62